an abrupt change into a north current occurred. Drifting in this current for 800 meters ascent at an extremely low velocity, the balloon was then carried along in a westerly wind changing to southwest from an altitude of 2,300 meters. The wind direction for the next 1,300 meters ascent as indicated by the balloon's course

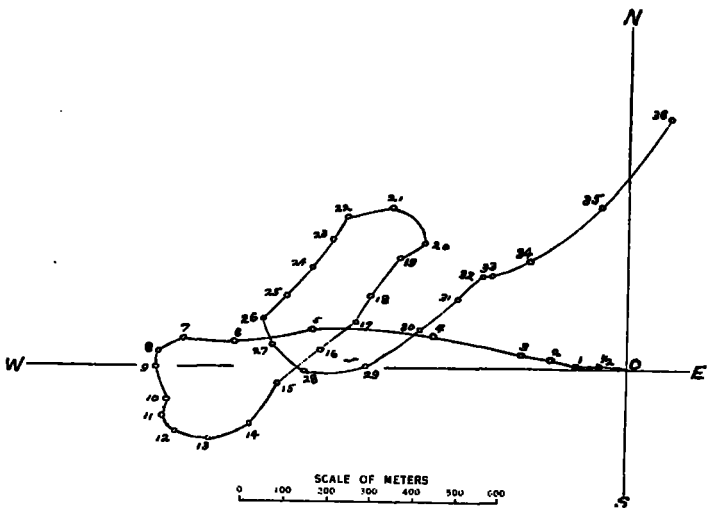

FIG. 1.—Horizontal projection curve showing position of pilot balloon at consecutive minutes.

remained fairly steady from the southwest, then backed to northeast about 400 meters higher. The direction continued from the northeast through an air layer about 1,000 meters thick and again changed through northwest and west to southwest at an altitude of 5,500 meters, and remained fairly steady to the 7,000-meter level where the balloon was lost to sight in a cirrus haze.

Except for short periods the wind velocity as computed was very light. A minimum velocity of 0.6 meter per second at the 2,000-meter level and a maximum of 4.4 meters per second at the highest altitude attained, were found to exist.

This rare atmospheric condition is thought to be closely associated with a thunderstorm which began at 7 a. m. of the same day and continued until a few minutes before the beginning of the balloon run. The sky which had been totally obscured during most of the day with heavy nimbus and cumulo-nimbus clouds began clearing rapidly about 20 minutes before 3 p. m. And in a comparatively short time the lower clouds had disappeared and a variety of upper cloud formations had appeared. The apparent counterclockwise whirling motion of the atmosphere tends to make more pronounced the close connection with the thunderstorm.

The wind blew directly toward the thunderstorm until within an hour of the beginning of the balloon run. The thunderstorm approached from the south-southeast, and as the exceedingly large mass of cumulo-nimbus clouds passed off the wind changed from north-northwest to northeast, east and, finally, when the cloud mass was away toward the northwest horizon it had shifted to the southeast from which it had changed during the first signs of the storm.

Consulting the weather map of 8 a. m. June 20, 1919, it is easily seen by the indicated wind direction at the several stations surrounding Broken Arrow that this station was near the center of a counterclockwise atmospheric circulation. Supposing that this whirl continued with altitude, it seems very probable that the whirls in the balloon's path were also a part of this circulation of greater magnitude.

The inevitable over-and under-running of these converging winds would undoubtedly account for many of the wind differences aloft, while the local thunderstorm winds such as outflow below and above and inflow at intermediate levels would add to the complexity. The counterclockwise direction of the balloon's path being cyclonic also suggests rising air.

Thus it seems that the balloon whirls, the thunderstorm, and the atmospheric circulation indicated on the weather map were in all probability closely interrelated.

PRESSURE FLUCTUATIONS DURING A THUNDERSTORM.

Father E. F. Pigot, S. J., of Riverview College Observatory, Sydney, New South Wales, has kindly transmitted to us the accompanying copy (fig. 1) of a record

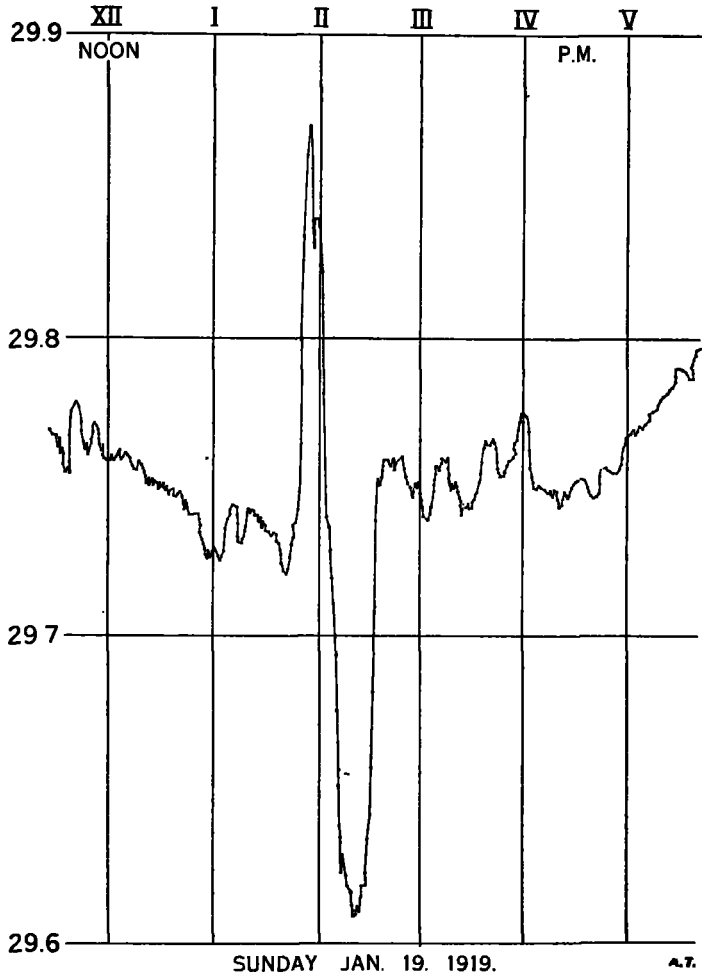

FIG. 1.

from a Murday microbarometer showing the large and rapid fluctuations of atmospheric pressure during the passage of a heavy thunderstorm and squall at Sydney, New South Wales, on Sunday, January 19, 1919. The record is in the form of dots, made at intervals of one minute.—ED.

[To face p. 396.

FIG. 1 (J. R. W.).—Mammato-cumulus clouds in west and northwest at 7:44 and 7:44½ p. m., June 24, 1914, Binghamton, N. Y.

FIG. 2 (J. R. W.).—Mammato-cumulus clouds in northwest at 7:48 p. m.